Minnesota Pollution Control Agency

March 30, 1993

Mr. William Taylor
General Mills, Inc.
P.O. Box 1113
Minneapolis, Minnesota 55440

Dear Mr. Taylor:

RE: 1992 Annual Report, East Hennepin Avenue Site, Minneapolis, Minnesota
Prepared for General Mills, Inc., January 1992

Staff at the Minnesota Pollution Control Agency (MPCA) has reviewed the above-referenced report. The report provides a thorough summary of the monitoring data and remedial action operations and is hereby approved. Enclosed are the MPCA staff's comments to the report. They are intended to provide our response to the work summarized in the report as well as guidance for improving future versions of the report.

Please note that MPCA staff cannot concur with the recommendation in the report, that the report be submitted on a biennial basis. Additional comments regarding the MPCA staff's position regarding this matter are provided in the attached comments.

If there are questions or you require additional information, do not hesitate to contact John Seaberg, staff hydrogeologist, at 296-7824 or me at 296-7776, TDD (612) 297-5353, Greater Minnesota TDD 1-800-627-3529.

Sincerely,

Dagmar Romano

Dagmar M. Romano
Project Manager
Response Unit I
Site Response Section
Ground Water and Solid Waste Division

DMR:pk

Enclosure

cc: Tom Alcamo, U.S. Environmental Protection Agency, Region 5
Peter Sabee, Barr Engineering Company

Minnesota Pollution Control Agency Staff Comments
For The General Mills 1992 Annual Report

GENERAL COMMENTS

A list of references for those that are cited in the text should be provided; for example, Barr (1985) and Barr (1991).

SPECIFIC COMMENTS

Figures 5, 6, 7, 13, and 37

Water levels from pump out wells are not representative of the piezometric levels within the formation and, therefore, should not be used to develop piezometric contours.

Page 1, Paragraph 1

The report states that "the monitoring data was collected and submitted quarterly to the MPCA project leader." This is not accurate. The MPCA project leader currently receives only the cover letter for the monitoring data without the data. Quarterly monitoring data was recently requested from Mr. William Taylor but, as a result of Mr. Taylor's explanation, agreement was reached that providing the data in the annual report would suffice. However, our position continues to be that it would be helpful to receive the monitoring data on a quarterly basis. Beyond that, U.S. Environmental Protection Agency (EPA) has indicated that they would like to receive the quarterly data also.

Page 10, Paragraphs 2 and 3;
Page 11, Paragraph 2

The text states that drawdown is inversely proportional to the distance away from the pumped well, which contradicts basic well hydraulics theory. Drawdown in a porous medium under ideal conditions decreases logarithmically with distance away from the well at any given time.

Page 12, Paragraph 1

The statement that "the number and distribution of monitoring wells is not sufficient to determine" the degree of anisotropy in the Magnolia Member of the Platteville Formation is not supported. In fact, the present monitoring system may allow a very good characterization of horizontal anisotropy. Methods have been developed to allow such a characterization in fractured anisotropic aquifers (Papadopulos, 1965; Jenkins and Prentice, 1982a and 1982b; Maslia and Randolph, 1987; and Novakowski, 1990). Maslia and Randolph (1987) present a graphical method modified after Papadopulos (1965). This method requires that the pumped well be located at the origin of an arbitrary x-y coordinate system. A minimum of three observation wells are required. Each observation well should be in a different quadrant relative to the pumped well. The directional diffusivity is graphically plotted on polar graph paper for each well, to which an ellipse is fitted. This allows determination of the transmissivity tensors and their principal directions.

The well distribution of Magnolia Member at the General Mills Site (Site) meets the initial criteria to evaluate the anisotropy of the aquifer. Five observation wells (six, if the other pump out well is used) are available for the analysis, with the possible exception of Well ZZ, which may hydraulically behave as a Carimona Member well. Moreover, the wells occur in at least three quadrants about the pumped well (Well MG1 or MG2). Determining the maximum and minimum transmissivities and their principal axes, as well as the transmissivity tensor in the direction of ground water flow, would provide a range of values upon which to base a SLAEM model, and would provide insights into the flow behavior of the system.

Barr Engineering Co. (1991) states that the model was calibrated, at least in part, by adjusting infiltration rates to the Magnolia Member (via changes to the resistance values of the overlying areal elements) to better simulate the asymmetrical shape of the cone of depression. Infiltration rates should not vary across the Site in the flow simulation without providing justification. If there is no reason to vary infiltration rates, the simulation should be conducted using the range of hydraulic conductivity values determined for anisotropic conditions (providing that the data are indeed appropriate for this method of analysis). Although this method does not account for anisotropy, capture zone effectiveness can be evaluated by bracketing the hydraulic conductivity values. This is especially true since the model relies heavily on uniform flow rather than boundary features that control flow. Despite the drawbacks of not being able to calibrate the model entirely to the piezometric surface of the Magnolia Member, this method is viewed as preferable over adjusting infiltration rates to achieve a head-distribution, which may actually be dependent on anisotropy.

Page 12, Paragraph 2

Vertical hydraulic resistance of the Carimona Member could account for the magnitude of drawdown in that unit without the presence of a leaky confining layer between it and the Magnolia Member.

Page 23, Paragraph 3

The monitoring data do not provide a sufficient basis to conclude where the TCE in the Magnolia Member primarily originates from. Only one well screened in the Magnolia Member is downgradient from the potential source area of the Site (Well TT). However, the well is not directly downgradient of the Site and, therefore, should not be used to characterize the impact of site activities on ground water in the Magnolia Member.

Page 24, Point Number 4

Please note that MPCA staff wishes to receive data on a quarterly basis (see comment for Page 1, Paragraph 1). Further note that MPCA staff does not concur with the request to submit the Annual Report on a biennial basis. Because the Magnolia system started up fairly recently and because additional work may be undertaken in the northwest portion of the site (based on currently unresolved questions from EPA's Aerial Photographic Analysis as discussed in a March 4, 1993, meeting with Catherine Meuwissen), we consider it important, at this time, to continue receiving the report on an annual basis.

REFERENCES CITED:

Barr Engineering Co., 1991, Magnolia Member Aquifer Pump Test Report, Remedial Action Design Plan, 2010 East Hennepin Avenue Site, Minneapolis, Minnesota, November 1991, 13 p.

Jenkins, D.N. and J.K. Prentice, 1982a, Theory for Aquifer Test Analysis in Fractured Rocks Under Linear (Nonradial) Flow Conditions, Ground Water, v. 20, n. 1, p. 1-21.

Jenkins, D.N. and J.K. Prentice, 1982b, Corrections to "Theory for Aquifer Test Analysis in Fractured Rocks Under Linear (Nonradial) Flow Conditions", Ground Water, v. 20, n. 2, p. 231-232.

Maslia, M.L. and Randolph, R.B., 1987, Methods and Computer Program Documentation for Determining Anisotropic Tranmissivity Tensor Components of Two-Dimensional Ground-Water Flow, U.S.G.S. Water-Supply Paper 2308, p. 1-16.

Novakowski, K.S., 1990, analysis of Aquifer Tests Conducted in Fractured Rock: A Review of the Physical Background and the Design of a Computer Program for Generating Type Curves, Ground Water, v. 28, n. 1, p. 99-107.

Papadopulos, I.S., 1965, Nonsteady Flow to a Well in an Infinite Anisotropic Aquifer, Proceedings of the Dubrounik Symposium on the Hydrology of Fractured Rocks, International Association of Scientific Hydrology, p. 22-31.